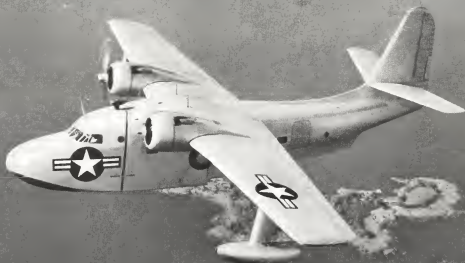


AVIATION WEEK

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JULY 18, 1949



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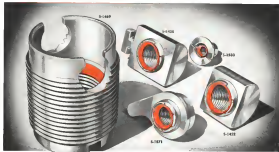
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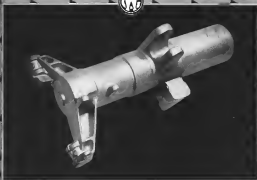


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AAF Claims

Some sobering old water is found in wartime Eighth Air Force claims regarding its proven against the German Air Force in the crucial volume of the official history of the Army Air Force in World War II. Written by AAF historical officers under official auspices, the book, under Staff papers, says nothing of captured German Air Force records indicated that "Eighth Air Force claims were far more exaggerated than even their ownist critics admitted."

For example, the Schweinfurt mission of Oct. 14, 1943, when 60 of 291 Boeing B-17s dispatched on the mission were shot down by German fighters. Eighth Air Force claimed 138 German fighters destroyed. GAF records show that only 18 fighters were lost in all combat for that day.

The Schweinfurt mission reached its apex when the B-17s to penetrate Germany without fighter escort. Total of 148 B-17s were lost mostly to enemy fighter action and control of the air was definitely lost to the GAF until early in 1944, the history concludes. The historians say that discrepancies between AAF claims and German records are so wide that they raise fundamental questions regarding evaluation procedures of the AAF.

Progress Report

Proposed legislation specifying precise procedures for military contract termination has now been cleared by the National Military Establishment and is before the House of the Budget Committee for consideration at the present session of Congress on June 1. With approximately \$125 million in cancelled USAF contracts and a smaller amount of small contract defaults, speed-up of all through Congress will be necessary before either USAF or Navy can properly balance their procurement books and conclusions know just where they stand financially on the cancelled contracts.

Loan Deadlock

Sen. Edward Johnson (D., Colo.), chairman of the Senate Interstate and Foreign Commerce Committee with jurisdiction on the Civil Aeronautics Board and Sen. William Fulbright (D., Ark.), chairman of a Banking and Currency subcommittee with jurisdiction over the Reconstruction Finance Corp.,

Jobs Vacant

Three \$10,000 a year aviation jobs are still vacant with no immediate prospects of their being filled. They are assistant secretary of the Air Force—vacated by G. V. Whitney when he moved to Convair Corp., assistant secretary of commerce for aeronautics—left open when John Alton became president of Trans World Corp., and the new post of executive vice president of the Air Line Pilots Assn.

are deadlocked over how to ensure repayment of RFC loans to airlines.

Johnson wants RFC to appoint a director to the board of each carrier with RFC subsidiaries. Fulbright wants the 1938 CAA Act amended to require the requirement for CAA approval of RFC loans. "This would mean that loans would be made to airlines on a straight business basis, without the requirement that CAA would be obligated to protect them through mail pay," Fulbright told *American Weekly*.

Johnson is vigorously opposed to this, commenting that "CAA is the expert on airlines and if Congress should be consulted by RFC." Fulbright is likewise to the Johnson proposal. Johnson's proposal, relating to RFC policy, comes under Fulbright's subcommittee and Fulbright's proposal comes under Johnson's committee.

Damon Speaks Out

Ralph S. Damon, former American Airlines president and now president of TWA, has disclosed the inside story of why C. R. Smith called on his decision to give speedy approval last year to the American Overseas Airlines-Pan American Airways merger pact. According to Damon, Smith indicated that Edward Hughes had gone "Floyd Collins" power of attorney to sell TWA's international routes and that Collins even then was trying to contact PAA president Juan Trippe.

Smith reportedly suggested that if TWA sold out its international routes to Pan American first, Americans could not get as good a price for American Overseas. Noah Dietrich, Edward Hughes' assistant, last month denied Hughes gave power of attorney to anyone to negotiate with Trippe. Damon and that point to his misgivings.

ten from American over the merger deal, he had been disappointed by his inability to get C. R. Smith, then AA board chairman, to back actively a companywide recovery program. In 1948, Damon declined, AA usual to be spending too much money for equipment and manpower.

Although negotiations with PAA for sale of American Overseas began early last October, Damon and Smith did not inform him of the deal until more than a month later. When Smith told about it, he said Smith "This is a joke, son of a bitch."

John E. Slater, former AOA board chairman, who also resigned because of the merger deal, won't tell about it until next June. Both Slater and Damon felt that the approximately \$79 million dollar Pan American is offering for American Overseas is an absolutely low price to pay for the money-losing company.

Squeeze on National

Damon Air Lines president E. V. Rickenbacker believes Pan American Airways pulled a "sneaky" on National Airlines during negotiations such as this year on a stock sale and equipment arrangement whereby PAA and W. R. Grace & Co. would acquire control of NAL if CAA approves. While Trippe was negotiating with NAL president G. T. Baker, a PAA director called on Rickenbacker and said he was opposed to the Pan American-National Cruise deal. According to Rickenbacker, the director and PAA would have to invest several million dollars in transfers National and support EAL and PAA might get together.

He reportedly suggested that PAA and EAL buy 100,000 shares of each other's stock and have "outside representatives" on each other's board of directors.

Rickenbacker said he was not interested in this, but the EAL had agreed to discuss equipment interchange with PAA. These documents were broken off abruptly when Trippe closed Rickenbacker that PAA and NAL had agreed on an exchange pact.

When Rickenbacker next met Baker he and he told PAA had used EAL as a proxy. Baker replied, "Well, you know better, because Trippe told me if I didn't agree to an exchange, he was in a position to make a deal with Rickenbacker—it's either with me or him." Of Trippe, Rickenbacker declared, "He and I never see eye-to-eye on anything."

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NEWS DIGEST

DOMESTIC

Paul B. MacCready, Jr., 21, of Weston, Mass., won the 1953 National Soaring Contest at Elburn, N. Y. He flew a Polish built Cirkoljig.

André B. Shaw, director and senior vice president of W. R. Grace & Co., became president of Procter when Harold J. Roge retired.

Eric B. Bovey resigned as United Aircraft Corp. vice president and general manager of its Charles Wright aircraft division in Dallas. Frederick DeWitt, assistant general manager, is acting general manager.

Le. Gen. Burton K. Yount (Ret.) was named commander of the Army Air Force Training Command, dated at Phoenix, Ariz. He was 65.

XIIIF-1, Pratt & Whitney Navy helicopter, will join the HUP-1 as it enters production, under a Navy Bureau of Aeronautics specification.

American Society of Mechanical Engineers has announced James D. Cunningham of Chicago for its 1956 president.

A. M. "Tex" Johnson, for six years test pilot for Bell Aircraft Corp., has joined Boeing Airplane Co. as an engineering division flight test pilot assigned to the XE-47 Starliner test program.

Records for track down striking against Winslow Corp., leading agency at New York International Airport, halted longer investigation work, by stopping contact, fuel and equipment down at entrance to the field.

FINANCIAL

Curtis-Wright Corp. has accepted \$6,651 share of common stock for purchase from shareholders. From \$4.50 up to \$9.75 a share. Total was \$4,730,727 for the six months to May 31.

INTERNATIONAL

England's Bristol Aeroplane Co. just passed for at least two and possibly three months the first flight of the first engine. The engine is now being tested on the test bed.

Canadian Air Transport Board's chief research aeronautical engineer has been named deputy director general of the Canadian Defense Research Board at Ottawa.

Pakistan and Australia governments have concluded a formal air transport agreement, involving Quetta Enigma Airways and a Pakistan airline, when it begins operations.

INDUSTRY OBSERVER

Curtis-Wright and Douglas are doing preliminary design studies for the Navy on a turbojet-powered \$5,000 in attack bomber for operation off the Midway-class carriers (AVIATION WEEK, July 14).

Big transport manufacturers (Boeing, Convair and Douglas) are trying to interest the Air Force in tanker variants of their current transport C-77A, C-99 and C-124A. Since small refueling of both lighters and bomber losses in a major USAF requirement the market has a good aerial tanker now looks promising.

Boeing has developed its own refueling system to go with a tanker version of the C-77A. Instead of the gravity feed through a flexible hose running full to tail contacts (British system now used by USAF), the Boeing system uses large diameter hoses extending from the tanker's tail to the receiver's nose. Contact is made by a rotating, telescopic boom in a tailer under the C-77A tail. This telescopic boom has a flexible hose on the tip of the rotating boom that enables him to "fly" the boom into the contact point on the receiver. Fuel is pumped through the hose under pressure enabling a much more rapid transfer of fuel than by gravity feed. C-77A could carry between 6,000-7,000 gal. of fuel cargo. Boeing technicians are now modifying B-50 nose assemblies to take the new type of refueling equipment and USAF is expected to announce an order for C-77A tankers shortly.

Glenn L. Martin Co. is nearing completion of the prototype XB-51, a triple jet light bomber with a sweptback, variable incidence wing. Prototype is scheduled to fly in September. The XB-51 is powered by three General Electric 147 engines, two housed in wing nacelles and the third buried in the fuselage with ducts air taken on both sides.

Boeing trainer gun now living on a B-50 is also being considered for the Convair B-35 bomber and the Douglas C-124A transport. Bigrat gun still to be linked in the tractor gun is keeping dirt and rock from becoming loaded with the rollers inside the rubber road just after landing impact.

A. V. Roe of Canada has completed the airframe of its jet sear (C-102) and hopes to make initial flight of the prototype in August. Four Dowdell jet engines to be used in the C-102 are now undergoing final testing before installation.

Air Force is experimenting with delayed opening parachutes in being recovered instruments safely to the ground from an altitude of 100 miles. The instruments are contained in the waist of V-2 rockets now being used for upper atmosphere research. Initial 100-ft. pilot parachute cords the delayed work from 100 miles down to about 50 miles. Secondary density of the atmosphere around 50 miles causes the pilot chute to fully open, dragging out the main 100-ft. chute, which causes the instruments to the ground.

Bell Aircraft Corp. X-2 rocket powered research plane is now scheduled to make its initial flight and initial flight. The rocketing, rocket and plane powered by a Curtis-Wright rocket engine will be used to explore the transonic speed range between Mach .3 and Mach .2.

Stanley Aviation Corp. of Buffalo has an Air Force contract to design and install a probe pilot's cockpit in a Lockheed F-80 jet fighter. The pilot will be in his stomach stretched out on a seat he installed in Phoenix area. Aim of the probe position is to enable the pilot to take more in high-speed maneuvers than is possible in a conventional sitting position.

India was Thomas A. Fikes, of the McGraw-Hill Washington news bureau. He was coming from the Northland East leaders where he had been in special assignment for Reuters. Work at the gates of the Netherlands East Indies government. Twelve other paid U.S. news men went about the place.

Attending to preliminary aspects, the craft was to make from New Delhi to Bombay and was caught in a monsoon rain before reaching its destination. The plane apparently struck the left white ceiling and veering a bank in the darkness. Fire followed the crash.

Turnback Report

Lugene Baker that crashed a Pan American Airways Stratocruiser to turn back to Shawnee, showed from a breakdown at an air gate in the engine oil pump, a PAA investigator disclosed last week.

The plane was over the Atlantic bound from London to New York when the oil pressure dropped in the left outboard engine. The pilot cut off the engine, but was unable to feather the propeller, which waterlogged. An oil fire started around the nose section of the engine but was extinguished by the crewmen. The entire prop installation finally broke off.

Residues of the alloy gear is reported to have led to other trouble which resulted in failure of the prop feathering system.

Within four days, two more Stratocruisers returned to their departure points, but both were pilot's choice, not because they were unable to continue. For Air reports both were

outboard from below, the first for London, the second for Bermuda. The London-bound plane turned back because of a "rough" engine. Upon inspection an air oil outboard housing was found and the plane took off again the following day. A turbo-supercharger on the Bermuda-bound craft failed to operate and the pilot turned back rather than fly at a lower level in a storm area.

Maintenance Shifts to Civilians

Civilian maintenance contractors to the U. S. Air Force will get an increasing volume of military business during the fiscal year 1958.

Present plans of Military Air Transport Service and Air Materiel Command call for expansion of civilian contracting and maintenance contracts to include all MATS transport and possibly some military transport types operated by other commands.

►\$25 Million Base—Preliminary estimates indicate that between \$20 and \$25 million will be spent by AMC on civilian maintenance contracts during fiscal 1958. About \$15 million was spent during fiscal 1957 with Tecon Engineering and Manufacturing Corp. (TEMCOC), Lockheed Air Service Corp. and Transcon Air Lines for overhaul of 500 C-54 transports used in the Berlin airlift.

Shift in transport maintenance from AMC depots to civilian contractors is expected by MATS evaluation of the civilian service performed on airlift transports in Berlin, faster and about 25 percent

cheaper than AMC depot work. AMC depots required an average of 140 days to turn out a maintenance C-54 and some remained in depots as long as eleven months, according to MATS officials. In contrast, the Tecon civilian contract averaged 37 days per plane requiring two shifts of overtime and 50 planes per month using a 50-hour week.

►AMC Facilities—AMC operating bases overhauled depots employing 13,832 civilians and 14,567 military personnel. Yehli operating cost of AMC depots last year was \$113,007,176. AMC depots are located at Milledale, Tex., Wright Patterson AFB, Warner Robins AFB, Marietta, Ga., Majors AFB, Ogden, Utah, Columbus City, Tennessee, Calif., and San Antonio, Tex. Maj. Gen. Charles B. Stone III is director of supply and maintenance for AMC with Brig. Gen. George Marley as his deputy.

MATS officials give civilian maintenance contracts credit for keeping the Berlin airlift going during the critical weeks of last winter. They praised tremendously the ingenuity and initiative displayed by the contractors in meeting unusual maintenance problems. For example TEMCOC fabricated over 1800 C-54 parts required for the airlift. All of the major C-54s have gone through the maintenance cycle since and none of them are on their second trip through the contractor's shops.

►Removed from United-It is anticipated that civilian maintenance cycle MATS business heavily on the turbojets owned by the old Naval Air Transport Service at Moffett Field, Calif. and United Airlines. Navy still accredits its own C-54s at Moffett.

Disagreed final 1958 MATS plans to extend operations to include its Lockheed C-121A, Douglas C-76, Boeing C-97, Fairchild C-82, Douglas C-47 and Sikorsky H-19 helicopters. Lockheed Air Service Corp. already got a \$350,000 contract for the C-121A work. Pratt C-76 is now being overhauled by the Mobile Air Depot but it is planned to switch the C-76 work to Douglas. Specifications for overhaul of the C-97, C-82, C-47 and H-19 are still being prepared.

►Carrying Demand—Because of MATS outstanding success with cyclized reconditioning USAF troop carrier groups are now making a strong effort to have their transports taken care of by AMC depots and funded by civilian contractors.

Disagreed findings of the President's Air Policy Commission in 1947 announced operations of civil aircraft maintenance for the military that they could do the work better and cheaper than the military.

Depots. Shortly thereafter USAF changed its plans on the reconditioning program for war surplus Boeing B-29s and shifted work originally planned for the U.S. Marine Corps to the Aircraft Corp to AMC depots on the grounds of "economy measure." Being continued to do B-27 reconditioning at Visalia.

Turbojet Viscount Nears Completion

(McGraw-Hill World News)

LONDON—Viscount Airlines Ltd. is completing the second prototype of the Viscount, with two Rolls-Royce Tay turbojet engines instead of the four Daimler-Benz turboprops which powered the first prototype.

Construction is well advanced and it is hoped that flight tests will begin before the end of the year. The aircraft is being built for the Ministry of Supply, not as a potential airliner but solely for research and development purposes. No further details of the Tay engine may be given at present. The installation in the Viscount will be its first appearance as the new Viscount, the first Viscount prototype, which completed the initial phase of its flight tests in May, is being fitted with its pressurized cabin. The aircraft which has been shown in the Viscount by other operators from all parts of the world has been maintained in almost perfect condition since the announcement of the Viscount 700, an enlarged version capable of carrying 40 or 50 passengers. The development has been made possible by the increased power of the Rolls-Royce Dart K100 propeller turbine engines. Work was begun some time ago on the first of the 700s, but flight tests is still under way.

Industry Due for Tax Windfall?

New Internal Revenue ruling on prewar earnings base for wartime excess profits tax may mean big refunds.

The aircraft industry may receive millions of dollars in refunds as excess profits taxes as a result of a recent ruling of the Bureau of Internal Revenue. The new ruling applies only to current profits based on an earnings base during the wartime period.

Acting through its Finance Policy Tax Council, the Bureau has defined the accounting basis of the wartime excess profits position can accompany their "normal" income increase if the recalculated "normal" income base used to be higher, wartime excess profits would automatically be set back and refunds would be paid.

►Was Problem—BIR's ruling is part of a broad effort to do right by taxpayers who were unfairly treated by the wartime operation of the government's excess profits tax. The ruling affects the industry.

One of the most glaring inequalities the wartime leaders which the law put on companies just beginning to cash in on long, lean years of profitable development.

To use the heading, Congress authorized BIR to set up the Excess Profits Tax Council.

The job laid out for the Council to reconstruct—on the basis of the profits figures in each case—what normal prewar income would have been if (A) the war had not happened, and (B) the company had grown to maturity by 1918.

►\$5 Million Claim—As of June 30, 1948—the latest date for which figures are available—more than \$1,000,000 claim had been turned over to the Council for processing. The amount claimed is \$5.6 billion.

About one-half these claims have been disposed of. But since the Council has had to tackle the smaller claims first, the total involved has been as much as only \$1.5 billion. The Council will have about \$4.5 billion more to go.

Claims are still coming in, but the head figure isn't likely to get much higher.

The statute of limitations prevents filing of added claims more than three years after a tax return has been submitted. And since the excess profits tax was repealed in 1946, the deadline for filing is only a few months away.

►Faster Consideration—To show the kind of service their weight be considered in accompanying "successful" private industry the Council's ruling cuts the case of the hypothetical P corporation. The P corporation was acquired in 1926 to

manufacture aircraft. Until 1934, its activities were primarily related to research and development, sales were limited to contract body panels.

During 1934, however, the company shifted two types of plane for general use—military, the other obsolete for either military or commercial operations.

Through 1938, sales of increasingly modified and improved versions were made only to the U.S. Army and domestic airlines.

►Fought Outbreak—In April, 1939, P moved its contract with Crest Airlines for the speedy manufacture of 150 planes of its wholly military model Series 100A-1, after the shooting started, the number was upped to 510. Refrain spread to last night at the tail for the excessive expansion of P's facilities.

Over the years, P's output had risen from seven planes in 1934 to 134 in 1939. Its profits rose accordingly.

	Cumulative Military Production 1934-1939	Military Index 1934-1939	Military Index 1934-1939	Total Index 1934-1939
1934	1	1	1	1
1935	11	11	11	11
1936	22	22	22	22
1937	33	33	33	33
1938	44	44	44	44
1939	55	55	55	55

Under the law, P had to average profits for the years from 1916 to 1939 in computing its normal prewar income base for excess profits tax purposes. But P was still growing during this period. To make earnings for, say, 1937 would have pulled this average down far below the 1939 level.

►Accused—Recognizing this growth factor, Congress amended Section 722 of the Internal Revenue Code in 1942 to permit companies in P's position to use only 1939 earnings in computing its normal prewar profits base.

Remembering that P

- Was successfully changing the character of its business immediately prior to and during the boom period by introducing new products, by entering the foreign market, by expanding its facilities.

- It modified business had not yet reached the peak of its wartime period.
- A more realistic level of earnings would be reached by averaging two years later—1941—if the war hadn't intervened.

The Council, in general, tended to



TRACK-THREAD GEAR FOR D-50

gear for the field for operation of large units. Get a similar to that installed on Fairchild's P-40 and consists of an endless rubber and steel wire but which stores around a series of grooved drums and lugs.

Single wheel under sprocket is connected to track idler for ground test purposes and is not part of the landing gear, which is the largest of its type ever made and first of its type for heavy transport bombers.

Top speed isn't affected by the track load on air, this D-50, shown taking off from during flight, Seattle. Boeing-developed landing gear is being used in experiments to determine feasibility of using gearless.

Aircraft Group vs. General Industry

Surveys of working capital, profitability and assets measure aviation against other manufacturing firms.

The position of the aircraft industry shows greater perspective when viewed in comparison with other industrial groups.

Interfering contrast is afforded in a current study conducted by the Securities and Exchange Commission on the working capital positions of 1275 corporations covering the period from 1947, 1959, to Dec., 1965.

This study shows net working capital of 21 aircraft and aircraft component companies increasing from \$66 million at the 1939 year-end to \$425 million at the end of 1965. Far greater significance in any comparative studies, however, can be seen in the changes developing during the postwar years. Here a much different story is revealed.

Against Trend—This same number of aircraft companies showed a peak net working capital position of \$598 million at the end of 1945. At the close of 1946, this amount fell to \$423 million, a decline of more than 29 percent. By contrast, during this same period, the net working capital of 847 manufacturing companies in the SEC survey rose from \$18,853 million to \$32,138 million in a gain of more than 27 percent.

This shows that the overall working capital position of aircraft firms has trended considerably since 1945 and has not followed the more recent line of general industrial companies in the postwar period. Of all the separate industrial groups analyzed in the SEC study steel and steel were the only ones other than aircraft to have lost ground during the postwar period. And this decline was confined to less than 6 percent.

Variations Within Group—The relative performance of the aircraft group in this respect is nothing more than a reflection of the extreme definition of its activities from the scale of all large post-war operations prevailing during the war.

As with all averages, the experience has not been the same for all companies in the aircraft group. For example, North American Aviation shows a decline of only 5.4 percent in its net working capital from the 1945 to the 1946 year-end.

Grumman's net working capital decreased from \$31.5 million at the 1945 year-end to \$20 million at the close of

1948, a decline of about 35 percent. An opposite extreme is found in the case history of Consolidated Vultee Aircraft Corp. which showed a net working capital of \$56 million at the 1945 year-end. Three years later, this figure fell to \$13.2 million, a decline of more than 77 percent.

Inventory Factor—Net working capital determinations in the aircraft group are frequently including in their inflated liquidity. By their very nature, aircraft operations require considerable commitments in inventory and work-in-process. Such inventory amounts are not always commensurate in the values earned in balance sheets.

For example, Glenn L. Martin Co. and Convair had for a time owned a large valuation in their work-in-process inventories representing the development costs of new-type transports. Subsequent experience, however, revealed that these valuations were beyond recovery and were therefore charged to operating results with substantial losses reflected in the profits.

It is noteworthy that while firms have been a general shortage in the net working capital position of the aircraft business, inventories have had a tendency to absorb a greater percentage in the composition of current assets during the postwar period.

Inventory Rise—For instance, during 1945, inventories of the 21 aircraft firms surveyed by the SEC study amounted to \$457 million and comprised 28.4 percent of the industry's total current assets. The 1945 inflation shows no variation at \$735 million but this time comprising more than 46 percent of the total current assets.

The more recent inventory ratio of the aircraft industry appears to be more in line with the general experience recorded by the survey of the 847 manufacturing companies compiled in the SEC survey. In this instance, inventories comprised 48 percent of total current assets at the 1946 year-end compared with 34.5 percent at the 1945 close.

Profit Study—The relative profitability of the aircraft industry is outlined in another study prepared recently by the National City Bank of New York. This comprehensive survey which accom-

pans a total of 1552 leading American corporations reveals a record of extraordinary income. A total of 23 aircraft and parts companies are reported to have shown net income, before taxes, of \$17,571,000 for 1945 compared with a net loss of \$15,280,000 for 1947.

The 1945 average on a per share averaged \$4.40. This same average for a total of 1680 manufacturing companies in the National City Bank compilation came to 7.5 percent. In other words, the aircraft industry's average profits for 1945 were far below the same experienced by all manufacturing enterprises last year.

Of the forty-five separate industrial classifications shown in this study, only the most peaking group showed a lower margin of income than the aircraft held on. At the other extreme, the cement industry showed the highest profit margin with 14 percent.

Another interesting ratio presented in the National City Bank survey is the percentage return on net assets. For 1945, these same group of aircraft companies averaged but 3.3 percent in this respect. A startling contrast is again afforded by the average 18.9 percent return on net assets attained by the entire 1680 manufacturing companies examined.

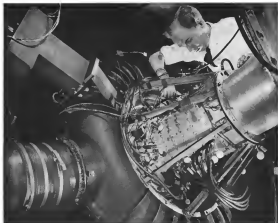
It is significant that the aircraft industry showed the lowest return on its net assets of any of the 45 industrial groups appraised. The negative return of 8 percent on net assets shown for 1947 by the aircraft group stands out as the only classification among all the individuals experiencing a loss during that year.

Assets Ranking—Still another study prepared by the National City Bank of New York reveals, by comparison, the relative weakness of the latest aircraft companies. In this compilation, a list of the 25 largest American manufacturing companies have been prepared at ten-year intervals starting with 1904.

The inflation in all of the start of 1945, shows the largest corporation, General Motors, at \$1.5 billion of total assets. The twenty-fifth company on the list is the Chrysler Corp. with total assets of \$541 million. The aircraft company showing the largest amount in net assets at the 1945 year-end is Cessna Wright Corp. with \$155,618,000. This reveals the relative location in the scale of large American companies enterprises of aircraft companies when evaluated by size.

When measured of assets, however, are not controlling factors in the outlook of any industry or company. The basic measure remains profitability and by this test the aircraft industry's position is currently rising. In belief that of all general manufacturing enterprises

—Selig Abraham



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► This research engineer is literally "probing" the inside of an Axial Flow Compressor...for data that will enable Wright Aeronautical to design better compressors blades today for tomorrow's jet engines.

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of the blades and cross-sectionally around the casing.

► From this data the Wright engineer determines the angle of attack, moment and axial position of the blades in each stage of compression. Result? Improvement in compressor design to provide a considerable increase in the overall efficiency and power output of new engines.

► Just as this research points toward better compressors, so the vital research technique involved results in greater laboratory efficiency. Very many hunches and failures are tested and

the more accurate data is obtained.

► This investigation of every slight detail of compressor blade performance is typical of the scrupulous attention to detail at Wright Aeronautical to produce better power plants for faster aircraft today and in the future.



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AERONAUTICAL ENGINEERING



DORNER MAMBA makes possible compact powerplant installation despite size of induction gas, because of side-by-side arrangement.

Double Turboprop Engine Built in Britain

Armstrong Siddeley gears two Mambas to coaxial counter-rotating propellers to develop peak of 3500 hp.

British engineers' confidence in the gas turbine propeller has been strikingly demonstrated by disclosure of a multiple engine.

Armstrong Siddeley Motors Ltd.'s new double Mamba, basically two Mambs flange placed side-by-side, is now under consideration for installation in two-seat planes. It was exhibited at the recent Paris Air Show.

Details of the engine, probably the first that have been disclosed on multiple turbine propeller units, show British progress with this type of powerplant.

Separate Operation—Although the two engines are joined together at the front and use the same air intake and propeller shaft reduction gear casing, they are two separate power units with their own fuel, lubrication and control systems.

Each engine has its own induction gear and drives one of two opposite rotating coaxial propellers.

Combination of the two Mambs, with their axial flow compressors, affords a compact power group. It is reported to permit high economy in fuel consumption when cruising at low power, with a high power to weight ratio for maximum power operation.

Either engine may be shut down and restarted independently, deemed a considerable advantage when maximum

thrust or endurance is required. Each develops 1775 hp and about 400 ft. per thrust.

New Reduction Gear—Reduction of speed required a from 15,000 rpm at the compressor shaft down to a propeller shaft speed of 1450 rpm.

Port engine drives the front propeller, starboard engine the rear propeller. Each induction gear is separate although the counterbalancing props are mounted coaxially.

On both port and starboard engines the induction is via a compressed cycle gas train. A helical van gear on the compressor shaft engages with those helical planet gears. Mounted on the same shaft as the three helical planet gears are three spur planet gears meshing with a housing internal gear (55 teeth). Attached to the planet gears is a crank arm which with them as they rotate drives the induction gear.

Mounted on the front of the crank is a spur gear. On the port engine, this drives the gear on the propeller shaft through an idler gear. On the starboard engine, it drives the propeller shaft through two idler gears. The extra idler on the starboard drive rotates the rear propeller in an opposite direction to that of the front prop. In either respect both drives are identical.

Oil Pressure for Bearings—The housing

internal gear is prevented from rotating by engaging with three bevelled teeth connected to three pistons.

Tendons for the internal gear to move radially due to torque reaction is balanced by oil pressure in the forward side of each piston. These pistons perform the function of a torsionmeter.

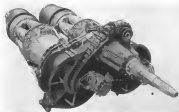
Pressure in the torsionmeter system is read on a gauge in the cockpit. Engine bhp is pressure (psi) x rpm / 3776.

The torsionmeter pistons are steel with cast iron sealing rings. Cylinders have steel sleeves in castings after, hence.

Bearing Details—The three spur planet gears are supported by roller bearings. A ball thrust bearing is provided at the rear end of each planet gear shaft to take the thrust of the helical planet gears. An adjusting washer is also provided to control the backlash of the helical gear assembly.

Each idler gear is supported on either side by a roller bearing. The center, or front propeller shaft is supported at the front by a roller and ball bearing (outer races are in the front cover) and at the rear by a roller bearing (outer races in the front cover only).

Inner or rear propeller shaft, passing through the front outer propeller shaft, is supported at the front by a roller bearing whose outer race fits in the gear hole. At the rear it is supported by a roller bearing and a ball bearing, with outer races fitting in the rear cover casing. Propeller thrust is



COOLING INLET and gear casing were both made in the double Mustang.

Double Mustang—Basic Data

General		
Maximum weight	12,000 lb.	
Maximum length	12.18 m.	
Overall length (tip of propeller to rear cowling)	12.18 m.	
Wing span	19.51 m.	
Wing area	200 sq. ft.	
Wing loading	17.6 lb./sq. ft.	
Empty weight	7,000 lb.	
Useful load	5,000 lb.	

Performance — Sea Level	Altitude	Propeller	Max. Thrust	Max. Power	Max. Speed
Engine	Engine	Engine	Engine	Engine	Engine
Maximum climb	15,000 ft.	8	2,400	770	270
Maximum climb	15,000 ft.	140	2,400	770	270
Maximum climb	15,000 ft.	140	2,400	770	270
Maximum climb	15,000 ft.	140	2,400	770	270
Maximum climb	15,000 ft.	140	2,400	770	270
Maximum climb	15,000 ft.	140	2,400	770	270
Maximum climb	15,000 ft.	140	2,400	770	270
Maximum climb	15,000 ft.	140	2,400	770	270
Maximum climb	15,000 ft.	140	2,400	770	270

taken by the ball bearing on both propeller shafts.

Engine Arrangement—These are mounted parallel to the centerline of the engine in the front and rear of the fuselage, with the main engine mounted at the rear and the auxiliary engine mounted at the front.

The drive is transmitted from the propeller shaft reduction gear through a single reduction gear to the main engine, which is mounted at the rear of the fuselage. The drive is transmitted from the propeller shaft reduction gear through a single reduction gear to the main engine, which is mounted at the rear of the fuselage. The drive is transmitted from the propeller shaft reduction gear through a single reduction gear to the main engine, which is mounted at the rear of the fuselage.

mounted on the end of the fuselage.

The main engine is mounted at the rear of the fuselage. The drive is transmitted from the propeller shaft reduction gear through a single reduction gear to the main engine, which is mounted at the rear of the fuselage.

The drive is transmitted from the propeller shaft reduction gear through a single reduction gear to the main engine, which is mounted at the rear of the fuselage. The drive is transmitted from the propeller shaft reduction gear through a single reduction gear to the main engine, which is mounted at the rear of the fuselage.

reduction gear casing above the propeller shaft.

The drive is transmitted from the propeller shaft reduction gear through a single reduction gear to the main engine, which is mounted at the rear of the fuselage.

There is a second, auxiliary engine mounted at the front of the fuselage.

To avoid a connected drive between the two engines, a free wheel assembly is built into the main gear wheels on the auxiliary drive shaft.

The auxiliary drive can transmit up to 100 hp at maximum rpm, and is so arranged that full power is available when either engine is idling.

Lubrication System—On both engines a main pressure-type oil pump supplies oil at 70 psi to the propeller control gear, main pump reduction gear bearing, oil jets for the reduction and auxiliary gears, metering pump, high pressure oil pump, and thrust main and thrust compressor bearings.

The metering pump feeds the main engine bearing with 1 pt. of oil per hr. This rate is adjustable. Quantity of oil fed to the thrust main bearing is controlled by metering governor.

The high pressure gear-type oil pump, which operates at 70 psi, feeds the main pressure pump, supplies oil only to the reduction cylinders.

All excess oil drains into a sump and filter at the bottom of the engine. It is drawn off by the scum pump and directed through an oil cooler back to the tank.

The oil consumption is less than 2 pt. per hr. for each engine at the maximum continuous rating of the engine—14,000 rpm. Maximum oil inlet temperature is 90°C, and the normal temperature is 70°C.

Oil Cooling System—Lubrication of the propeller reduction gear on each engine is separate, and circulating oil is directed by a valve in the reduction gear housing. Thus, one engine can be removed from the system without disturbing the lubrication system of the other.

If one oil tank is utilized for the two oil systems it is considered necessary to have a control valve in the tank to be sure that the two systems are completely independent and each engine sees only its own oil supply.

Independent starting for each engine is provided by a hand-starter motor mounted on the propeller reduction gear. The oil tank also may be started independently.

Independently adjustable oil star valves on a bench mounting 2 or 3 orifice orifices.



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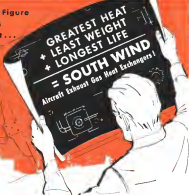
MAILS Air Basic Service emergency medical service parachute team is using a new Derry slot parachute, which gives the jumper far greater control over his landing spot than has previously been available. By the use of guide lines that can give him a forward or rearward "steering speed" up to 3 mph.

The slots, located in the front and rear of the chute extending from the apex to the apron, are made by shaping a panel which forms "N" cutout cut. A guide line extends from both apex edges of the slots to the jumper. By pulling on one pair of lines, the jumper closes a slot. When the lines to the opposite side are released the slot is opened, causing air to split, creating a reaction in either direction.

Out of the Woods—The new gas-chute, was invented by Frank M. Derry, a "waste paper" with the U. S. Forest Service. Derry formerly was a rigger and jump instructor with the Elgin Parachute Co. and began work on his slot idea while serving as a post-chute instructor and jumper with the Forest Service from 1942 to 1945.

At Moscow, Service parachute teams are trained in specific rescue and survival tactics to provide first aid to survivors of aircraft crashes. The team members are trained in snow and water jumps in addition to techniques for jumping into wooded areas. "In old problems has been solved by the addition of a 75 ft nylon rope to the clutch equipment to permit "rope ladders" down high trees. This rope is visible as a ridge on the right leg of the clutch shroud.

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Two new fighter airplanes equipped with life support from air currently going through flight tests for certification. These structural performance figures and pilot aids might be made available for prototype commercial operations and provide greater safety for private airplane owners.



One of three in the air all month at the Great Lakes 170 (above) aircraft with a Comptrol 141 (below) aircraft engine. The latter is the 213 (left) from the Great Lakes 170 (above) which will be in a prototype for the first time \$3,000.



One of the most interesting projects completed recently in the field was the design and construction for the Aero Transcommunications Corp. Board of a 32 foot shallow Draft Cargo Launch. It is built in three sections, from nose and center, for easier handling and can be loaded in a 6-12 cargo plane.

The launch is intended primarily for transporting men and supplies in desert areas. Weighing only 1,000 pounds empty it carries 2,000 pounds of cargo yet draws only 24 inches of water. Its 10-horsepower engine can be powered for towing on various floats, and it is a genuine type boat mounted in the engine compartment.

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Color Television Tried in Ramjet Run

Feasibility of adapting color television for observation of combustion phenomena is being tested in a long-closed by Wright Aeronautical Corp. in cooperation with an engine development contract with the Air Materiel Command.

A demonstration recently conducted at the company's Wood-Ridge, N. J., laboratories was probably the first one in which color television has been applied to see this type of operation in progress.

Color Multisync Ramjet color is an important indication in combustion research and engine performance, color television often involving potential as a substitute for close-up viewing by engineering personnel. It would serve to eliminate the considerable, hazardous radiation with the operation of the target test rig.

- Temperature variations range up to 3,000 °F.
- Pressure in the combustion system may be 20 times that of the outside.
- Heat, vibration and noise, too intense.
- And general danger to operating personnel increases with increase in size of the target test rig.

Research Project—Wright Aero's an indirect study is being conducted on a 6-in. oil combustion system. A three-quarter full of the jet engine section to simulate turbine conditions.

Flame under investigation includes effect of various variables: variation of flame distribution, and blowout—a characteristic tendency of the engine, resulting from the high speed of the air through the combustion chamber.

Color television could offer important aid in research on these operational factors.

Previous Application—At the recent Wood-Ridge demonstration, the test was run under the direction of Dr. Peter Goldstein, director of engineering research and development at the Columbia Broadcasting System.

This company designed and built the equipment consisting principally of a camera, monitor console and the equivalent of a 12-in. viewing screen. It was loaned for the Wright Aero demonstration by the company, Smith, Kline & French Laboratories, pharmaceutical manufacturers who previously exhibited the use of color television in surgery and medicine at a meeting of the American Medical Association in Atlantic City, N. J.

Observation Details—The camera was set up to the control room and through the observation window, viewed the target chamber at about 20 ft. distance.

Flames were seen on two screens in an adjoining room.

General effect of the observation was good, but it showed that sharper definition of colors in the colored flame would be desirable. Considering that the demonstration was an unaided "dry run," more effective reception would undoubtedly be obtained with more experience and planning for this type of application.

Windows—Since close-up observation of the flame would be most desirable, apparently the best location for the camera would be at three windows (two under section) and quartz windows (two latter sections) in the control room. Then, with the aid of several cameras, the various chamber sections could be scanned.

But intense heat and vibration on constant with testing of large strength phenomena, would bring technical difficulties which would have to be taken to prevent the close proximity.

Four TV Cam—This is not the first time that television has been used in directly Wright Aero, previously has experimented with black and white television as target testing.

And Remington Rand Inc.'s Vericon television system, also black and white has been used in engine testing and in Aero Ordnance activities.

In the latter work, a remote control mechanism with portable unit seems to define detector or diagnostic, burning, high explosive-filled heads in properties than before. It is a portable unit, while the operation is kept under constant surveillance via a television viewing screen.

Seven cameras in disposable plants already use Vericon portable television with color plates scheduled to follow shortly.

Both the CBS and the Vericon devices use a normal cable instead of transmitting impulses through the air.

Stratocruiser's Filter

By using activated carbon as part of an air conditioning system of the Boeing Stratocruiser, engineers were able to make a relatively small compact air conditioning plant do the job of a much larger one.

Developed jointly by Boeing and the W. H. Corcoran Corp., N. Y., and weighs 55 lb. and takes up only 1 1/2 cu ft. Hence made it possible to limit air intake rate to 1000 cfm (about 25 percent of the total fan volume), although cabin air is changed every 90 seconds.

A shaped fibrous filter, catch dust and aerosol residue filtration under pressure. Air then passes through gelatin and activated carbon tubes which work on odors.

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Journal of Management Education 32(10)

Results of widespread tests give valuable data but no definite answer.

Service testing of a variety of non-flammable hydraulic fluids for aircraft (AVIATION WEEK, Nov. 15, 1948) has accumulated valuable data, but none of them change the situation that existed six months ago: no suitable fluid is available.

Results now are at hand on tests conducted by the Civil Aeronautics Administration, TWA, Boeing and United Air Lines over the past few months. They will indicate that available fluids are either nonflammable or stable by drastic fluids—but not both.

► **Hydrologic U-4**—The fluid developed by the Navy and which has its approval for use on the aircraft is Hydrologic U-4. While results of Navy aerosol tests are unavailable, TWA has been testing that fluid in the cabin vapor chamber system of a Constellation.

This is a separate, self-contained system and approximately 825 hrs have been accumulated. TWA reports no concern with pump and motor parts due to the lack of adequate lubricity of the fluid at high operating pressures. Another difficulty is the susceptibility of the fluid to oxidation, resulting in erosion of operating parts due to oxidation. This tendency of U-6 is observed as it wears faster than standard ANVYN-165 fluid.

► **CAA Tests**—The CAA has tested this fluid in both a Douglas DC-3 and DC-4. Tests on the latter airplane have been discontinued because of excessive corrosion in magnesium fittings and valves in both the a/c and tie-in hydraulic systems. Its use in the DC-3 is continuing, but results in this airplane show some indications as in the DC-4.

Boeing Airplane Co. recently tested U-4 in a mockup of the Boeing 577 Stratocruiser hydraulic system and accumulated some 100 hr. of service time at various temperatures. Near the end of this period a leak was charged in the system and some 20 hr. later the entire system broke down due to accumulation of sludge.

Boeing engineers traced the difficulty to the fact that the cooler had been cleaned with carbon tetrachloride prior to installation and this residual was plainly upset the chemical balance of the 1/4 fluid ounce container.

• **Skysdal—United Air Lines** has been testing this product of Monsanto Chemical Co., Skysdal in the cabin supercharging system of a Douglas DC 6 and has accumulated approximately 600 hr. of flight time. The system is still operating satisfactorily and until it is de-

possibilities the exact extent of liability of the food trust be determined.

However, Cramer reports that insulin or heparin itself has no effect on insulin or heparin binding. It also has a deleterious effect on electron microscopy which has been noted in the field. Although other tests indicate that insulin binding is not a measurable

to the East, no means have been laid for protecting existing wing

★ **StanCal Type A**—A new fuel StanCal Type A, has been tested by TWA as a supercharger run-in test stand and about 600 hr has been accumulated. Although this fuel has held up satisfactorily to date, TWA points out that the test installation was special fuel

test and that use of this kind in current aircraft, like U-6, would require complete redesign of the aircraft.

Other airlines, notably Trans-Canada Air Lines and Pan American Airways, are now testing one or more of these three fluids in closed systems in flight tests, and in ground laboratories.

However, service tests on these fluids over the past few months have uncharged the earlier assertions that most noncompressible hydraulic fluids, while exhibiting desired noncompressible characteristics, create corrosion, filth, sludge, oxidation and deterioration hazards that perhaps only an entirely new class and approach to the problem can solve.



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B-36: Fortissimo or Fiasco?

A British aeronautical engineer takes a critical look at the biggest piston-engine bomber in the world.

One must remember the extent of an American aviation magazine for his courage in evaluating the current and future status of the Convair B-36 long-range strategic bomber. Having previously criticized the project, he could have done in a golden instant, but the writer is glad to have the possibility of placing his cards face up on the table in stating the case against it.

No doubt that will require some of our American friends in and out of defense. At the outset, however, we will discuss any number of criticisms of current British bombers by clearly identifying the should be adopted to measure—or add for interest.

► **Physical Data**—First, one must get the performance facts cleared from behind the publicity puff, which have been given around the B-36. It begins with the prototype XB-36 at a design gross weight of 275,000 lb and the baseline engine at a range of 16,000 miles requiring a 15,000 lb. bomb load on a fuel mileage of approximately 21,000 U.S. gallons.

Assuming that the fuel and bomb load could be substantiated as a gross weight of 275,000 lb (a very doubtful premise in view of subsequent aerodynamic figures), the maximum 16,000-mile range with 15,000 lb. bomb load—both must be against target unless of about 3000 miles.

At this stage of development, however, the data are not of paramount concern, although it hardly appears that the widely published claim that "The B-36 could stay in the air for 24 hours in any isolated region of the world and return home without refueling."

This assumes the impossible hypothesis that the B-36 would be permitted to reach the first Corvus, base and back, without having to fight a determined offensive force equipped with high altitude jet fighters. That sort of hog must make the Russian smile in their beard.

► **Target Speed and Ceiling**—We next hear of the first performance batch, the B-36A, with a gross weight between 330,000 and 340,000 lb. In power, like the prototype, with Wright R-4400-25 engine. This engine is rated at 3000 hp. for takeoff and is claimed to give quarter to quarter an estimated maximum ceiling of 70,000 ft. up to a critical engine change height of 40,000 ft. One can infer from this a more realistic estimate of 60,000 ft. for this particular model.

Based on an exhaust back pressure taken of 31 in. Hg, and this gives a maximum power at 25,000 ft. of 35,000 ft. Hg up to approximately 20,000 ft. at 40,000 ft. On the latter assumption, the service

ceiling at the target could be as high as 45,000 ft. and the top speed about 140 mph at 35,000 ft.

The second performance anomaly, the B-36B has the gross weight estimated at 350,000 lb and is powered with the later R-4400-41 engine, with located to 1500 hp. for takeoff and a normal altitude rating of 3000 hp.

Again, there is considerable "doubletalk" concerning the power to altitude characteristics of the engine, a continuous rating of 3000 hp. being claimed up to 15,000 ft. compared with the earlier Model -25 on a gross take off an altitude drop of 5000 ft. for a very small power gain. We suggest that it hardly makes sense or progress and hence should be treated with reserve.

► **Case A**—However, on the basis—which we will denote as "Case A"—the service ceiling at the target works out to 15,000 ft. and the maximum speed to 150 mph at 35,000 ft. The optimum range cruising speed at this height is 750 mph and this should also be roughly the overall average cruising speed for a long-range mission. The data, most of the B-36 long-range flights have averaged around 710 mph; which seems to indicate considerable room for improvement in the cruise control technique.

The accompanying table shows all the aerodynamic facts face up. No attempt has been made to evaluate such secondary factors as engine cooling power loss, possible exhaust thrust augmentation or other effects on altitude, since to a first approximation, they modify one another.

Note that all altitude performance figures for the B-36B are computed on a gross weight of 350,000 lb at the target, not before the bombs are released. The target weight assumes a half-way range point of roughly 3000 miles, after some 40 percent of the fuel and oil has been consumed.

► **Case B**—Probably closer to the truth, however, is "Case B," which it follows a more logical trend in power output down the profile Model -32 engine used in the B-36A. It assumes that the power of the Model -41 engine in the B-36B has been increased by raising the exhaust back pressure limit of 31 in. Hg to 35 in. Hg. That is, in fact, a note for this assuming in the case of the Republic XP-12, which had a somewhat similar Wright Major configuration designed to operate at 40,000 ft. At this altitude, the maximum power at altitude is approximately 2600 hp. at 25,000 ft. drops off to 2150 hp. at 40,000 ft.

Power shortcomings (15) tend to lowering the maximum speed to 110 mph at 15,000 ft. and reduce the service ceiling against enemy fighters to 40,000 ft.—this considerably reducing the range of the B-36B. One does have a service ceiling over 40,000 ft. Case (A) and (B) are compared in the accompanying graph which shows the maximum drag the wing will support at 15,000 ft. The curve for Case (B) checks well with most bombing tests on the published. ► **Range Performance**—What about the range performance of the B-36B—low was the latest figure of 9500 miles with a 15,000-lb. bomb load over 1000 miles ob-

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San Diego, California

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Aerodynamic Data—Convair B-36B

Characteristic	Symbol	Value
Takeoff Gross Weight	W_0	325,000 lb.
Target Gross Weight (Bombs Out)	W_T	215,000 lb.
Target Gross Weight (Bombs Out)	W_T	300,000 lb.
Landing Gross Weight	W_L	135,000 lb.
Wing Area	S	3700 sq. ft.
Wing Span	b	210 ft.
Aerodynamic Efficiency Factor	e	0.77
Aspect Ratio	$A = b^2/S$	12.5
Reference Area	$A_0 = \pi A$	39.1
Parasite Drag Coefficient (Data)	C_{D_0}	0.005
Parasite Drag Area	$F = C_{D_0} A$	36.4 sq. ft.
Aspect Ratio (Data)	L/D	20.1
Propeller Diameter (ft.)	D_p	39 ft. 6 in.
Propeller Tip Speed (ft./sec.)	v	1100 ft./sec.
Propeller Efficiency (V_{∞})	η_p	0.75-0.77
Propeller Efficiency (V_{∞})	η_p	0.75
Specific Fuel + Oil Consumption (lb./hr.)	C	0.38 lb./hr./hp.
	Case (A)	Case (B)
Maximum Power at Altitude ($N = 2500$ rpm.)	15,000 ft.	40,000 ft.
	20,000/21,000	20,000/21,000
	20,000/21,000	20,000/21,000
	20,000/21,000	20,000/21,000
	20,000/21,000	20,000/21,000

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Ground Power Supply

For starting and testing of aircraft and associated equipment, "Recho-starters" 124-1001 portable power unit features standard 4.4 amp output at 28 v. current with less than 2 percent max ripple voltage. Ripple frequency is 720 cps.

Made by McClellan-Chenille Corp., 4122 S. Figueroa St., Los Angeles, Calif., unit has continuous rating of 500 amp at 28 v. d.c. and momentary load rating of over 1000 amp. Voltage stabilizer holds drop from no load to full load, well within 10 percent. Voltage variations due to changes in motor load, within rated output, are within ± 5 percent (less than 1.5 v.).

Power unit can be pulled by one man or towed by truck. Self-lubricating ball-bearing roller skids and over 50 lbs. for transportation can be mounted in and compartment. Device can be furnished with 10 ft. a.c. cable (flexible) or with capacitor-type C-83 cable with 500 ft. length.



Machining Aid

New type round case tool, Style 16T, for boring in length by plunging and leveling both ways, is announced by Kennametal Inc., Latrobe, Pa. Tool has been on file supplied in Grade K10 at \$25.

It is available in 1 \times 1 \times 12 in. or 1 \times 1 \times 12 in. sizes. Tip, for both sizes, has 2 in. radius at extreme point. Bore diameter is .75 in. at each side.

Rolls Sheet Products

Skinn, rubber-covered rolls, offered by Connecticut Sheet Rubber Co., 497 East St., New Haven 9, Conn., are designed to permit processing of many sheet plastics, sheetmetals and fibers at high and low temperatures, rooming, soft and ambient from -100 to $+100$ F.

Rolls may be adapted for raising sheet materials into or out of hot or cold dips, removing excess fluid or for heat setting. Product is represented to be resistant to many chemicals and will not deteriorate after thousands of passes.

Material is claimed to have high dielectric strength, which is maintained at elevated temperatures. Sheet chemistry is reportedly does not build up on rolls as on metal covered units and they will not carbon track from moisture.



Carries More Fuel

New airport fueling truck, developed by Standard Oil Co. of California, 125 Bush St., San Francisco 20, Calif., is claimed to have much greater gasoline and motor oil capacity, with appearing smaller than some of its competitors.

A six-cylinder engine type, truck is GMC AT-700 Model and will carry 1700 gal. of fuel and 300 gal. of oil. Gasoline is delivered at rate of 300 gal./min. to aircraft through two hoses connected to separate delivery systems utilizing dual centrifugal pumps and powered by truck engine. Separately driven gas pump and delivery system supplies oil at rate of 15-18 gal./min. Equipment permits operator entering plane loads, and filters keep out particles larger than 10 microns.

For fueling maintenance around large craft truck is confined to two sides, and steering is hydrostatic by power. Additional feature is high-bridge, extendable, metal ladder for attendants to swing leading edge of large plane. Ladder can stowed inside compartment.



One-Ear Headset

"1 ear" single-phone headset with ear only 5 in., offered by Teles, Inc., 1000 Park, Minneapolis 10, Minn., has phone boom which slips into ear and is held in place by glass. Other ear is free for normal conversation.

Device is represented to be either side of head so simply that it can not fall off. It has single cord equipped with standard plugging connection. Volume control is optional. Unit is claimed to be suitable for telephone, radio and aviation headset use.



Cargo Aid

For cargo loading, portable "Lift-Aid" containers, now available with hydraulically controlled lift and hydraulic "Doo-lift" frame, is designed for quick-handling of wide variety of materials. Made by Lake Shore Engineering Co., Inc., Muskegon, Mich., device is hydraulic system permits belt reversing and speeds up to 400 ft./min. System is powered with electric motor or positive engine. Frame, which is mounted on four wheels with 4.00 x 8 pneumatic tires, permits adjusting container height at low and from 20 to 46 in., and at high end, from 4 to 15 ft. depending upon conveyor length. Frame is equipped with a low bar and unit can be pulled by hand or vehicle. Containers are available in lengths from 10 ft. up, in multiples of 7 ft., with belt widths of 8, 10 and 16 in. Special lengths and widths can made to order.



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are specified on Whitaker's outstanding new hot air valve. Whitaker engineers were impressed by the many advantages these couplings have over a standard bolted joint. The venturi type used for this application can be installed or removed in seconds. It withstands temperatures up to 1800°, is easy light, yet provides a highly positive seal.

The Marmar Eas includes couplings for various types of joints—straight for supporting tanks and accessories—bend clamps for all kinds of hose and flexible bellows.

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Modelled climate's effect
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Almost perfect cable with copper conductors and steel and copper braid.

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FULLER BRUSH CO. was Mailed in order for Fuller brothers' debts, while ...



ASSISTANT PATRICK BRYNE CEO. Business, law, film and more offers for executive travel.

Push ten-place Grumman amphibian is number two postwar executive craft; owners utilize factory service.

Northern and Southern Hemisphere
and closed

Seven owners have flown their airplanes to Europe without modification to the aircraft. Private owners, like William E. Boeing, Vincent Astor, and Frank W. Fuller, Jr., normally make extensive vacation jaunts of thousands of miles, including such overwater fly-outs.

Having reportedly seen his Millard as a tender for his yacht, while Aaker lends his craft to his pilot for charter where it is not otherwise needed. King Fawak of Egypt is scheduled to take delivery of a new motor yacht from the Millard.

► U.S.-Niger industries had not only as there for their companies.

- The Texas Co., with two Malleo, has a plant in Louisiana for visiting underwater oil drilling operations to the Gulf.
- Hydro-Electric Power Commission of

• Supreme Chief (Two Medicine), has used the cash for establishing airstrips along the Nile, the plane's dropping off tech workers and supplies.

- **Hudson Bay Mining & Smelting Co.**, announced a purchase of the assets of 50

• **Twentieth Century-Fox** has been spotting film locations from the set, gave the Millard a supporting role in one of its new films. Some of the scenes involved flying in turbulent weather for authentic shots.

• The N.Y. Daily News Greenstein has figured in a number of newsbytes for the paper, most noteworthy being during the 1985 Florida hurricane. Flying from N.Y., News photographers and reporters scouted all news agencies for complete coverage by following along in the trail of the disaster. Wimpshott's apparent carnal in the place permitted transmission of the on-the-spot photos almost immediately. Although the Mail had not been used heavily, the paper facts it came in help by making possible such coverage.

► **Factory Servicing**—Mallard sales are handled directly through the factory in Ithaca, N. Y., and as a result nearly all the owners return their phones for checks and adjustments. Some of the problems have put in 500 hours before coming in for a major checkup. Several GPs from a Mallard in Iran, Egypt with 700 hours on it.

Governor says that it can completely tear the surplus down and have it in the net three four weeks later.

Four months ago the company shifted Malfield production from Plant 2 to Plant 1 because the space was needed for output of the much larger TRP-1 Alkathene series reactor installation for the Nercs. Sales volume of the Malfield is at the point where one-and-a-half to two of the craft are being turned out per month, although the base price (with adials) has gone from \$115,000 to \$150,000. The highest priced Malfield sold thus far was three to Amstar Petroleum Co., at Batavia, for \$160,000 apiece, because of extra radio equip-

0091

The Milwaukee county board has voted to advertise for bids to operate the Curtis-Wright Airport. The field had been operated by Flightways, Inc., since the county purchased it from that firm two years ago, but the airport has been closed to flying since last fall, while the county enlarged and improved it. It is expected to be ready for re-opening by late summer.

tool shall be located to the right of and closer than the RPM control. Where a master control is replaced by a component (single power control unit), it shall be placed as indicated in paragraph 1 above.

(b) Where a component power control unit is used the side exit of controls shall be separated from the operating controls by a safety guard which may be movable only by deliberate movement of the control. The control shall be so designed that a forward movement thereof shall provide accurately such conditions. The maximum safe distance shall be obtained by a full forward movement thereof. Any intermediate position which automatically provides a partial subsequence condition will be so indicated to provide both auditory and visual identification of the position.

8. Supercharge—(a) The supercharge control shall be located on the left and below the throttle control or on the side of the pedestal. Where a ring-and-piston mechanism is the supercharge control is not to prevent such control to inadvertently move into the low power position when released from high position a positive stop for limiting the control lever in the lowest position is required.

(b) Activation motion of the supercharge control shall be upward or forward or take off. No locking device shall be used in the power control, RPM control, or master control shall be applied to the supercharge control.

Control Knob Blazes—Section 9 through 14 of the proposed safety knob design to be used for emergency power, RPM, master power, landing gear and landing flap control. Section 15 designates the flight instrument panel operation.

Puerto Rican Official Hits Strato-Freight

(McGraw-Hill World News)

SAN JUAN-In a report covering Strato-Freight's C-46 crash in which 51 were killed, Detroit Attorney Jose G. Aponte charged that the airline, West Coast Airlines, and the Capital Travel Agency were specifically responsible for the disaster. He asked the Civil Aeronautics Board to revoke licenses of chief pilot Wakefield and mechanic Carlos Perez.

The report also recommends that those involved be charged with "aviation homicide." Aponte's findings have been submitted to Gov. Manuel Mena, who will present them to federal authorities during his Washington visit.

The report made the following accusations:

- Strato-Freight's C-46 carried insufficient life suits, chief pilot Wakefield operated the aircraft overloaded and accepted a takeoff and immediate maintenance. The C-46 previously had flown from Newark to Miami to Puerto Rico with defective flaps, "which indicated that the aircraft was not in appropriate condition to make the flight."
- West Coast Airlines Service was

chance Carlos Perez in changing defective spark plugs put in plugs not approved for C-46. As a result many plugs burned out on take-off. It is recommended that the company be barred from the Grande Aepul until it is certified to handle maintenance and repair.

• Manager of Capital Travel Agency was not authorized to sell airplane flight tickets. The Public Service Commission was asked to release the agency's license.

Public Service Commission and Transportation Authority was asked to the airport to arrest regulations on weight, to get weight statements from three operators on aircraft base weight, and violation of weight statements.

• Non-OKed Non-landing—While the Strato-Freight crew was still being debriefed, a C-46 of American Transport Co. with 62 aboard developed engine trouble after takeoff from San Juan but managed to get back to the airport safely.

Unions Join Calif.

Carrier Battle

The tooth-and-claw fight between outfitfitted and unoutfitted carriers on the West Coast has reached an impasse.

So labor unions representing ground and flight personnel of the regular air lines operating in California have joined with management in opposing that outfitfitted carriers are permitted to fly with inadequate safety standards.

Civil Aeronautics Board and CAA officials state that none of the charges leveled against the outfits are worth out foundation. Western Air Lines president T. C. Drewett opposed the attack on the outfits since this month (Aviation Week, July 11). The outfit has been taken up by the Air Line Pilots Assn., the United Automobile, Aircraft and Agricultural Implement Workers of America CIO, the Air Line Stewards Assn., the Airlines Communications Employees Assn. CIO, the Air Line Dispatchers Assn. AFL, and the Airlines Division of the Brotherhood of Railway and Steamship Clerks, Freight Handlers, Express and Station Employees.

• Point to Washington-In telephone to the Civil Aeronautics Board, members of Congress, that outfits are required that California outfit agencies be placed under the same common and safety regulations as the outfitfitted airlines. "Safety regulations governing the operation of the 'outfit' and the regular outfitfitted outfitfitted airlines is as far apart as to

be almost incompatible," the union declared.

The unions' outburst followed Drewett's warning to his employees that the fly or its aircraft lines operating in California with two outfitfitted outfitfitted outfits a serious threat to safety, weight and working conditions. In his position on the Los Angeles San Francisco route, compared with \$23 and \$21 for their outfitfitted outfits.

• Safety by the outfitfitted outfits to have the California legislature and state public utilities commission regulate the outfitfitted outfits' operation more severely, to meet obligations, passenger weight, to get weight statements from three operators on aircraft base weight, and violation of weight statements.

• Changes Requested—The union asked army of the charges which outfitfitted outfits at the outfitfitted outfits. They said that the outfitfitted outfits' standards are below those of the outfitfitted outfits from the standpoint of maintenance, dispatching, communications, and pilot qualifications.

Why, the union asked CAA, should the outfitfitted outfits be allowed to fly the Los Angeles San Francisco federal airway according to one set of rules while the regular outfits must follow much more strict safety regulations while flying the same route? "Soner or later," the outfitfitted outfits declared, "all outfitfitted outfits in scheduled interstate operation of passengers over the federal airways will be obliged to observe the same safety and economic rules."

Many of the implications made by the unions against California's outfitfitted outfits carriers cannot be supported. CAA and CAB officials told Aviation Week.

For example, one of the outfits was asked by the unions why they are these outfits have allowed to operate with outfitfitted outfits, please outfitfitted outfits, similar to those governing a "light outfitfitted outfits"?

Answer is that the California outfitfitted outfits are not permitted to fly their transport under regulations similar to those governing a light outfitfitted outfits.

The unions also asked Why when regular outfitfitted outfits are limited to 55 ft of flying a month, does CAA place an outfitfitted outfits on the outfitfitted outfits of the outfitfitted outfits? Why are the outfitfitted outfits required to carry a 5000 lb outfitfitted outfits on every flight?

• Federal Agencies Blame—CAA and CAB officials told Aviation Week that the California outfitfitted outfits have not met the 55 ft flying limit and carry adequate fuel reserves on all flights. In fact the outfitfitted outfits have been governing scheduled interstate carriers and outfitfitted outfits scheduled outfits in its own outfits more exacting than the comparable outfitfitted outfits for outfitfitted outfits.



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Richard Johnston, Jr., of Chicago, Ky., sent us proof that:

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GENERAL ARRANGEMENT



"Stratocoach" Spurs Skycoach Study

Boeing proposes 103-seat Stratocruiser as other signs reflect interest in lower air travel fares.

By Stanley L. Colbert

Plans for a domestic and international Super-Skycoach carrier now under construction Boeing Airplane Co.'s proposed 103-passenger "Stratocoach" series of its \$7.5 million Stratocruiser, although other Gulf may be in the making.

Boeing, the Civil Aeronautics Board, Department of Commerce and International Air Transport Assn. have taken different views on the air coach operation. But Boeing, taking an early, but come up with a modified Stratocruiser carrying either 99 or 103 passengers. At current operating costs, according to the company, it could:

- Show a \$2500 profit on nonstop transcontinental runs, operating with a 60 percent passenger load factor and 93 percent cargo factor. This would be an increase of \$925 per month per flight over profit the company claims could be made if regular 75-passenger Stratocruisers are used.
- Show a \$1000 profit per flight per month on a 103-passenger version of \$18,918, operating with a 65 percent passenger load factor and 70 percent cargo factor. This would be an increase of \$1023 per month per flight over profit possible with the regular 75-passenger Stratocruisers.

In the 99-passenger version of the Stratocoach, space is provided seating for a galley, the 103-passenger version put five more seats in this space. Boeing's announcement of the plan fits in the Super-Skycoach picture along with those other developments.

• International Air Transport Assn., which tabled more, pending more detailed study, in introducing lowest rates this spring, has decided to cut trans Atlantic fares during the winter. Special rates, good only on roundtrips, will reduce fare from \$450 to \$465.70.

• Northwest Airlines, through K. R. Ferguson, vice president operations and engineering, has hinted that its Stratocruiser may go into a domestic Skycoach operation. Said Ferguson, last flying before a Senate committee: "Our experience with most service indicates a vast mass air transportation needed making at lower fare levels.... North-west may not be the first airline to offer the much-needed three cost fare."

• Department of Commerce claims about 15 million families in the \$1000, \$6000 income bracket, compared with only 4 million families in the over-\$1000 bracket. Herbert A. Wilcox, chief of Commerce Dept's Bureau of Aeronautics, recently told members of the New York Aviation Committee: "There are the people for the most part just on vacation time. This provides a tremendous potential for travel."

• Airlines and travel agents told Aviation Week that bookings for Christmas travel next year is likely Year-on-Year—always are coming in and should get better after the summer season. • Post American Airlines president Tom Wierpe, but said he is counting on using Stratocruisers to offer world-wide tourist class air transportation at one-third or more below regular rates.

CAB has turned thumbs down on international Skycoach service. It told American flag carriers that "transit fares should not be included at this time. There are no indications at present that transit services can be performed at substantially lower cost than regular service."

"The only classes made for substantial cost reduction in tourist service outstrip the use of the Boeing Stratocruiser for which no experienced cost data will be available for some time" (Aviation Week, May 9).

CAB is concerned over increased cost per requirement, and possible decrease of regular traffic to low-fare flights.

• Lockheed Plane—The Stratocruiser is the only plane proposed for nonstop service. Lockheed has plans for a 90-passenger version of the Constellation Model 99, making a 18 ft. longer than the present model and increasing maximum gross to possibly 115,000 lb. The plane would be powered by Wright compound engines, giving it possibly 20 percent more range. Originally the craft was designed as a freight carrier (Aviation Week, June 1).

American Airlines reportedly is planning a 96-passenger DC-4 and a 101-passenger DC-6.

While CAB has disallowed U.S. flag long-haul air service to Europe, it has permitted Transocean Air Lines and Seaboard & Western Airlines two unregulated carriers—to carry students abroad that summer at lower than regular fares. Youth Agency held Aviation Week the students pay \$190 for a month's ride, considerably less than what it would cost them to travel be scheduled service (Aviation Week, June 17). Both TAC and SAW expect to be scheduled for students under the Youth Agency plan.

Meanwhile, a youth-type Stratocruiser is already in service. Midway Air Transit Service is using a "high-density" DC-7B, with nine double seats and alternative triple seats, to accommodate 55 passengers.

Tax Reduction

Some reduction in transportation taxes at this session of Congress are possible, the industry hopes.

President Truman called for removal of the 3 percent transportation tax on property.

The Senate Finance Committee approved legislation reducing the 15 percent tax on air carriers to 10 percent.

Several corporations, including Pan Am, McGraw-Hill, and others, distributed with both the President's recommendation and the Senate committee's action, measured the possible profit for complete removal of the transportation tax on both property and persons.

STRICTLY PERSONAL

THEY NEVER FLEW EASTERN AGAIN—Bob Hope, our Nassi Editor, sends this one a treat. Eddie Rickenbacker had been plagued by a batch of customers once again with the same disturbing message. He ordered each acknowledged with a friendly letter but never received any answers. Finally, he ordered a careful check. All of the "overseaspeople" had died. It seems a curious EAL pilot was pretty sure at having to by the night cargo man which (arguably) carried captives. So he would steal back into the cabin, write his good cards by flashlight, and sign the names and addresses of his "passengers."

(The message on each card was: "This is the last time I will ride your airline.")

THAT DISTANT COPILOT—Hansen Sledge, Director of Special Projects Development for Boeing Aerospace Corp., says what's going around Detroit clicking on some VHF car radio recently in newspapers on the Toledo Times, which is a Boeing plant, is "a very interesting coincidence." The VHF was on 132 was at the end of the very noisy lot for mail. The USAF says he having some trouble and couldn't work the tower, which was showing green lights at that. The TWA pilot finally broke a patent circuit with another speed for clearance. The tower said, on adding other clearance, "I don't know, who he can't think off." The downed TWA pilot cranked back "Maybe they are wrong about who's going to fly."

PHILES OF THE P.A. SYSTEM—Charlotte D.Y. Walden, airport manager at Dallas, writes that he heard this message blaring throughout the Dallas terminal the other morning: "Walt Paezner: Scramball please check with information counter, American Airlines." Wonder how many people showed up? And United Aircraft Corp.'s **Nana Clement** tells how he almost missed a plane because he thought the P.A. system's loudspeaker was using 502 after the *Gun Gun*. "Who didn't's speech," he smothered about oversteering P.A. speakers.

IT'S DOUGLAS AROUND THE WORLD—According to Dick Dawson, Cintas Martin Co.'s PFO, his opposite number at Carter-Wright's Columbus plant, one Bill Mahoney, is still arguing with the telephone company. Many months ago the unliking utilities people put not only the CW plant, but Bill's own home as well, on a new exchange. The exchange is "Douglas."

NICKEL, NICKEL, NICKEL—Manager B. M. Dodson was probably humming the Pops Cols song the other day as he made out his latest report to the Public Utilities Commission on the success of his San Francisco Airport. In May he took in \$367.90 in inventory receipts, a nice gain over April's \$244.85, and Maudsl's \$241.10. Mr. Dodson stopped long enough to make an entry in his report to the effect that the total amount is 77,000 tickets. He is pretty optimistic about this particular commission, even if it's a new theme.

IT WAS JUST A WHISTLE STOP—Tipped off by other employees that she had two fans who couldn't speak English, Mid-Century hostess Betty Beasley checked the manifest the other day a flight and talked successfully with each passenger. She decided someone had been running her.

While walking through the No. 2 cage compartment with coffee for the crew, she was suddenly asked "Cesano cats used?", Spanish for "How are you?" Mrs. Bentley became startled and wondered whether someone was slipping her a line on freight. She found the voice. Two Spanish parrots were willing away their trip to the Tropic Cities. On her way back she found these parrots had acquired a well-known American custom. Both whistled at her.

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Air Marking & Civic Pride

"Thank God for the air markings," were the first words of a Navy jet fighter pilot to his cotenant after a crash landing recently.

B. L. Kay, owner and operator at the small airport near Greenfield, Ohio, pulled Lucite-Clears John S. Hill from his P-51, banded him into Kay's own plane, and rushed him to a hospital at Columbus, for which he received a commendation from the Navy Department.

Mr. Kay said the pilot had encountered bad weather, was off course, his fuel was running low, and when he saw an air marking on the roof of a Greenfield warehouse he decided against trying to reach Columbus, and came down on the short rough runway.

"In that case," the Greenfield Daily Times reported proudly, "the air markings more than paid off."

Blanche Noyes, that trades testimony of air marking, is rightly proud too. She writes us:

"While hundreds of service men have told me of their bettering lot and being saved by an air marking or crash landed their planes due to the lack of air markings, this is the first time in several years that a military pilot has expressed his appreciation via the press. This marker was constructed to match markers which was installed by CAA with funds which were appropriated by Congress in our 1947 budget.

We are very proud that we have been able to have 4320 air markers installed as a result of the \$108,000, net only appropriation for the actual construction of air markers since World War II. It has been proven that air markers are used not only by private flyers but by 500 mph. pilots of military planes so that the \$108,000 which was appropriated by Congress has more than paid for itself in the lives and equipment that the markers have saved."

But Mrs. Noyes reminds us sadly that there are no more federal funds for material, and the entire air marking progress has bogged down. Strangely enough, even groups, flying organizations, and the like, who were willing to construct the markers when materials were furnished have lost their interest.

How can it be that a nation so proud of its fine highway system and with such understanding of the value of the thousands upon thousands of state and federal road markers, can fail to realize the vital need even for one air marker in each small community?

On the highways markers are commonplace, and we demand them to the extent they frequently mean the difference between life and death.

Civic pride alone, it seems to us, should demand adequate air markers in every city and town.

We Americans are funny people. We export billions of dollars for the recovery of Europe, and feel we are humanitarian, but we let our own lives hang their way and needlessly crash and die in our own neighborhoods for lack of simple air markers costing a few dollars.

The Rails Are Wary

About 60 eastern railroads have pleaded with the Interstate Commerce Commission for higher passenger fares. They want to raise the basic coach rate from three cents a mile to about 3.75 cents. First class fares would be lifted from four cents a mile to 44 cents. Traffic is declining.

The air action with the steadily growing boldness in their competitive ships at the airlines in the advertisements and you can see what our railroad friends really fear. The new air coach phenomenon is drawing blood.

The rails are even going to expensive plans to point out that their coach passengers don't "ride in the baggage car." They refer to Northwest's combination passenger-cargo coach with the ingenious folding seats.

The western roads may have jinked all of those reasonable combination baggage and passenger cars they had but we doubt it. We know for sure the eastern roads (and it is they who want the higher fares) are still using their combination affairs on their suburban "service" because we have to ride them on the western Long Island. If they want as fast as combination DC-3s, however, even the new fares the rails want would be laughable.

Airlines have tremendous inherent advantages of speed and economy if it is given the choice by intelligent and government to develop its maximum public service. The railroads show by their bolder and bolder advertising that they realize this. At that, they are cheaper than some people in aviation who are finding it easier to stand pat than to push ahead and experiment with better ideas.

Why Lawyers Love Aviation

It is obvious from the record that a group of the more scheduled airlines have turned some more to first lawyers to help fight the irregular.

So in light of the large losses are reorganizing their intervention forms wholesale and losing them on the Civil Aeronautics Board.

That was when one carrier intervened against another only when he was directly affected.

Now we have Eastern Air Lines filing an intervention against Southeast & Western, an overnight courier carrier which cannot be mid to compete with EAL. Eastern is also filing against carrier operating between the Pacific Northwest and Alaska.

Pacific Northern, an Alaskan carrier with an interstate agreement with Pan American connecting at Seattle, files an intervention against the Virgin Islands Air Service and Caribbean American.

American and American Overseas are filing against Alaska Central, and against East Coast and Caribbean airlines. American also goes to bat with Aerovias Sud Americana, Inc.

Many and more it's a lawyer's war. All the public asks is better, cheaper service. ROBERT H. WOOD

Why Leading Aircraft Manufacturers SPECIFY ENCLOSURES OF "LUCITE"

CONSOLIDATED VALT'S L-15 LIAISON AND AMBULANCE PLANE
and other modern military aircraft have enclosures of Du Pont "Lucite" acrylic resin. Such enclosures are easy to install and maintain, and offer undistorted views.

PROTECT PERSONNEL!
Special type "Lucite" offers out-protecting eyes.

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Resistant to sunlight, rain, and snow.

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Transmits 90-92% of visible light.

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Du Pont "Lucite" acrylic resin is used with outstanding success in World War II for canopies, nose enclosures, life rafts, instrument covers, and other vital parts of U. S. Army and Navy aircraft. "Lucite" is currently supplied in sheets of various sizes for use in building military, commercial, and private planes. If you need it, investigate.

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AMPERES ON RUBBER TIRES



This portable 500-amp aircraft energizer was developed a few months ago by General Electric engineers to furnish commercial and military air bases with a convenient 28½-volt ground power supply. The heavy-duty power source provides plenty of amps for starting jet and reciprocating engines, for pre-flight check of the aircraft's electrical system, for production tests in shop and hangar repair areas.

Mounted on wheels, the energizer can be furnished with either gasoline-engine drive mounted in a trailer (as in the photograph) or a-c motor drive mounted on a two-wheel dolly. The basic generator and control system is available also for "Jeep" mounting. The mobility of the unit permits faster takeoffs as well as strategic dispersal of aircraft during hostilities.

This power supply is one of many products manufactured by General Electric for the aviation industry. G-E engineers are continually at work designing new and better products to increase efficiency and cut operating costs. Get complete information on our aviation products from your nearest G-E representative. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*



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- IGNITION AND POWER SYSTEMS
- ACTUATORS
- GENERATORS
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